THOPHA HUTCHINSONI, A NEW CICADA (CICADOIDEA: CICADIDAE) FROM WESTERN AUSTRALIA, WITH NOTES ON THE DISTRIBUTION AND COLOUR POLYMORPHISM OF *THOPHA SESSILIBA* DISTANT

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Abstract

Thopha hutchinsoni sp. n. is described from Western Australia, where it is found near Exmouth and at the eastern fringe of the Pilbara region. New records of *T. sessiliba* Distant are given, confirming the presence of the species west of the Great Sandy Desert. The colour of these 'western' *sessiliba* is different from specimens found east of the Great Sandy Desert and it is suggested that these 'western' *sessiliba* might represent another new species. A population of melanic *T. sessiliba* is recorded from Haliday Bay, near Mackay, Queensland and a melanic individual from near Chillagoe, Queensland, is also noted. A brief discussion on the size of *Thopha* Amyot & Serville species concludes that *T. saccata* (Fabricius) remains Australia's largest cicada.

Introduction

The cicada genus *Thopha* Amyot & Serville includes four described species distributed through New South Wales, Queensland, the Northern Territory and Western Australia (Moulds 2001). All are large to very large species and include *T. saccata* (Fabricius) and *T. emmotti* Moulds, which vie for the title of largest Australian cicada species.

Three of these *Thopha* species, *T. saccata*, *T. sessiliba* Distant and *T. colorata* Distant, were described 100 or more years ago. *T. emmotti* was described as recently as 2001 and its discovery was unexpected. Now, the discovery of yet another species of *Thopha* in Western Australia, which rivals *T. saccata* and *T. emmotti* in size, is even more remarkable; the first specimens were collected only in 2004. This new species, described here as *T. hutchinsoni*, appears most closely related to *T. sessiliba*.

New distribution records for *T. sessiliba* are also provided, including a number of records from west of the Great Sandy Desert, Western Australia. These western *sessiliba* are consistently different in colour pattern and it is suggested that they might represent yet another new species. Melanic colour morphs of *T. sessiliba* are also documented.

Terminology for morphological features follows that of Moulds (2005) except for timbal structure, which follows Bennet-Clark (1999). The following abbreviations have been used for collections housing specimens: AE - collection of A. Ewart; AM - Australian Museum, Sydney; PH - collection of Paul Hutchinson; MSM - collection of M.S. Moulds; WAM - Western Australian Museum, Perth.

Thopha hutchinsoni **sp. n.**

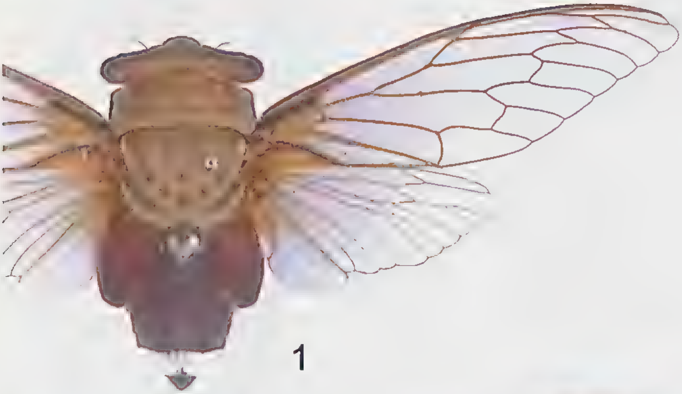
(Figs 1, 8-11)

Types. Holotype ♂, WESTERN AUSTRALIA: 55 km S of Exmouth, 8.iii.2004, P. Hutchinson (WAM). *Paratypes*: 1 ♂, Pinga Ck South, 135 km S of Port Hedland, 21°29.889'S, 118°43.935'E, 222 m, 11.ii.2006, Hill, Marshall, Moulds (AE) 1 ♂, same data (AM); 2 ♂♂, 1 ♀, same data (WAM); 1 ♂ (molecular voucher 06.AU.WA.PCS.01), 1 ♀, same data (MSM); 1 ♂, 1 ♀, ~40 km S of Newman, 23°44.412'S, 119°43.464'E, 624 m, 13.ii.2006, Hill, Marshall, Moulds (MSM); 1 ♂, 1 ♀, same data (WAM); 1 ♀, same data (AM); 2 ♂♂, 5 km N of Exmouth, 8.iii.2008, P. Hutchinson (PH); 2 ♂♂, 5 km S of Exmouth, 12.iii.2008, P. Hutchinson (PH); 1 ♂, 291 km S of Port Hedland, 22°37.771'S, 118°42.106'E, 707 m, 11.ii.2006, Hill, Marshall, Moulds (MSM); 1 ♂, nr Mt Robinson, 112 km NW of Newman, 23°03.386'S, 118°51.977'E, 12.ii.2006, Hill, Marshall, Moulds (MSM); 4 ♂♂, same data (WAM); 1 ♂, 13 km SE of Newman, 23°31.091'S, 119°46.216'E, 568 m, 13.ii.2006, Hill, Marshall, Moulds (MSM); 1 ♂, ~120 km S of Newman, 24°19.238'S, 119°42.330'E, 621 m, 13.ii.2006, Hill, Marshall, Moulds (MSM); 1 ♂, same data (WAM).

Description. Male (Figs 1, 8-10). Head pale muddy orange; vertex with a reddish brown fascia from eye to eye but terminating just short of each eye and ill-defined around ocelli; much of ventral surface reddish brown. Postclypeus mostly reddish brown, pale muddy orange dorsally. Anteclypeus reddish brown tending muddy orange laterally, dark reddish brown along midline, sometimes very dark apically. Lorum reddish brown with muddy yellow margin. Rostrum with mentum muddy orange; labium dark to very dark, dark reddish brown along groove, apical portion partly black; reaching almost to apices of hind coxae. Antennae with scape and pedicel reddish brown, the latter very dark to nearly black apically; flagellum black or nearly so.

Thorax. Pronotum pale muddy orange, the pronotal collar tending slightly paler; lateral margin of pronotal collar narrowly edged black. Mesonotum pale muddy yellow; an irregular reddish brown spot against distal inner margin of each anterior arm of cruciform elevation and usually a similar spot centrally at base of anterior arms; submedian and lateral sigilla ill-defined, but anterior outer corner of lateral sigillum usually marked by a small reddish brown mark; parapsidal sutures marked by a fine black line; silver pubescent band adjacent to wing groove, tapering posteriorly; lip of wing grove finely marked black on anterior half. Metanotum pale muddy orange. Thorax on underside dark reddish brown and muddy orange; extensively covered by fine white pubescence.

Figs 1-3. *Thopha* species: (1) *T. hutchinsoni* sp. n., male paratype from near Mt Robinson, Western Australia; (2) *T. sessiliba*, melanic female from Haliday Bay, Queensland; (3) *T. sessiliba*, male from 55 km NNE of Meekatharra, WA, *i.e.* west of the Great Sandy Desert. Approximately natural size.



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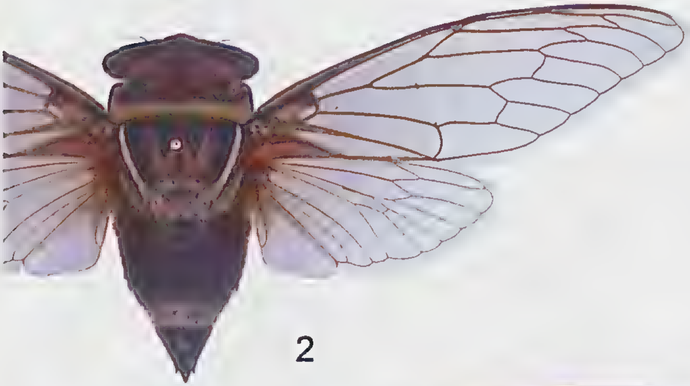

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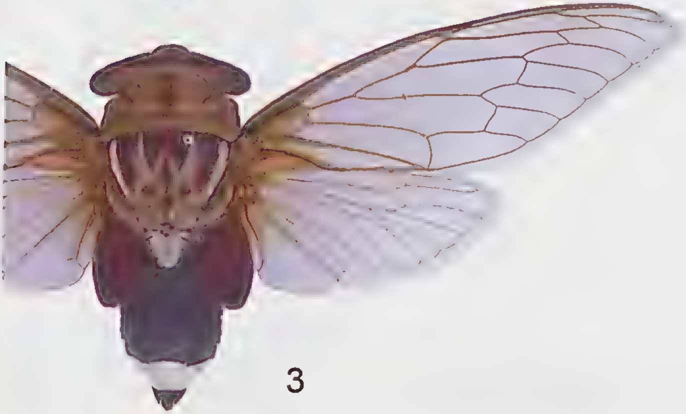

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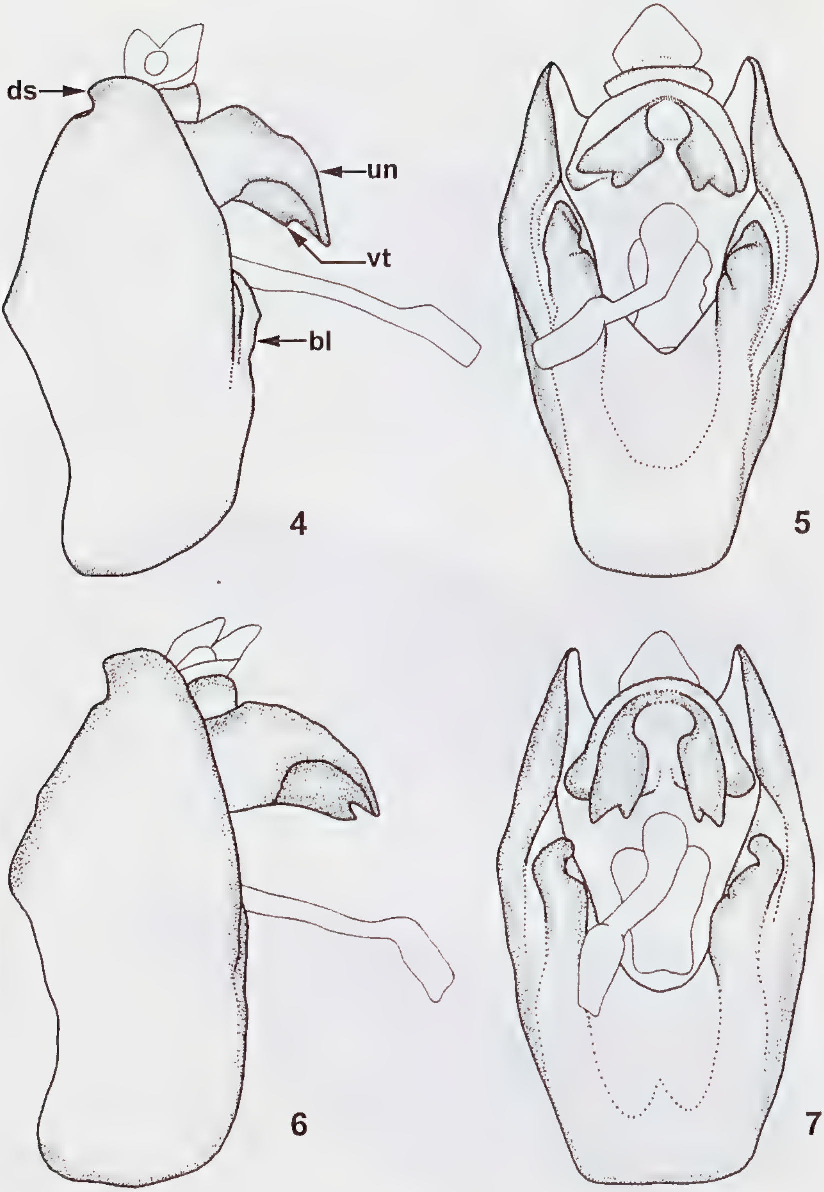
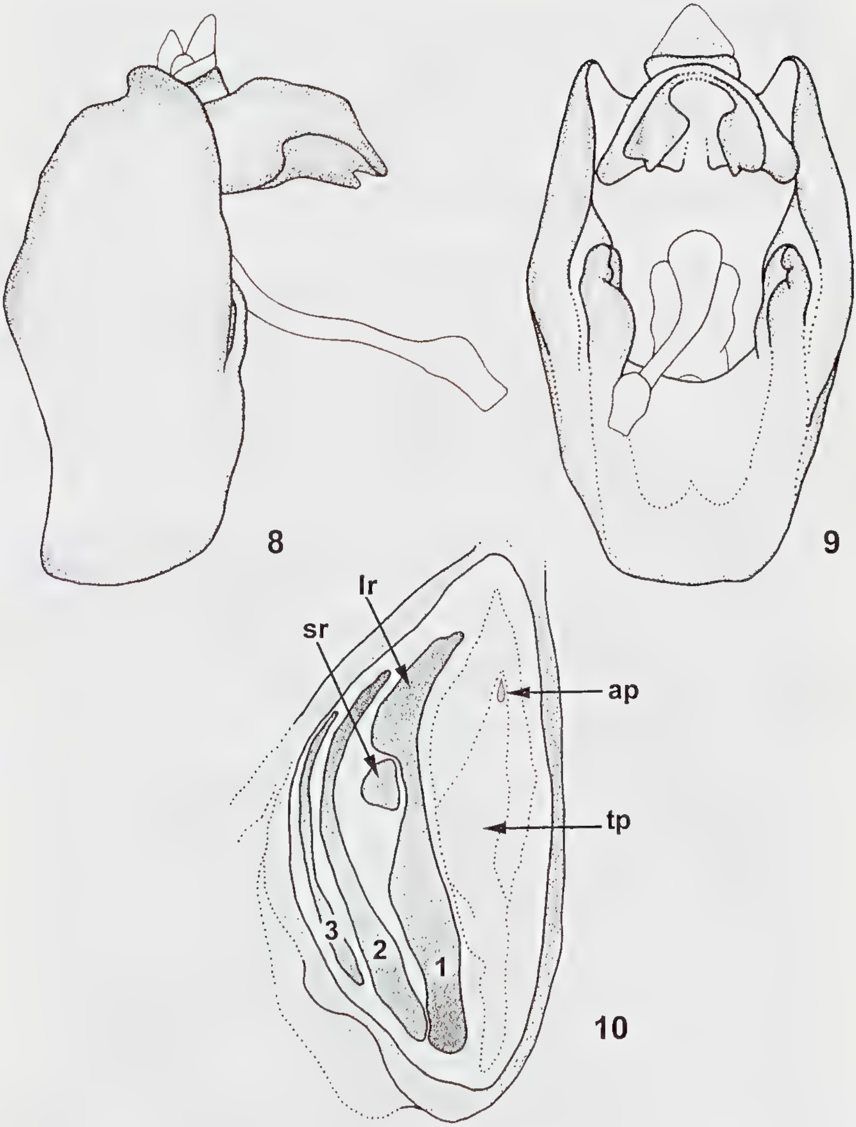


Figs 4-7. *Thopha sessiliba*, male genitalia: (4) lateral view, specimen from Conners R, SSW of Sarina, Queensland; (5) ventral view, same specimen; (6) lateral view, specimen from 146 km NNE of Meekatharra, Western Australia; (7) ventral view, same specimen. bl = basal lobe, ds = distal shoulder, un = uncus, vt = ventral tooth.



Figs 8-10. *Thopha hutchinsoni*, male genitalia and timbal: (8) male genitalia, lateral view, specimen from 40 km S of Newman, Western Australia; (9) male genitalia ventral view, same specimen; (10) left timbal showing the 3 long ribs and one short rib. ap = apodeme pit, tp = timbal plate, lr = long rib, sr = short rib, 1-3 = ribs one to three.

Wings hyaline and without infuscations. Fore wing venation pale muddy orange on basal half or so, otherwise mostly reddish brown; subcosta jet black along basal cell, jet black along 2A+3A in the vicinity of basal membrane. Basal cell opaque pale muddy orange but usually with a small window adjacent to CuA. basal membrane bright orange. Hind wing veins yellow or orange; plaga following CuP and 2A muddy orange sometimes tending blackish, following 3A mostly orange but sometimes mixed with black.

Legs dark reddish brown tending partly muddy orange. Coxae usually with dense white pubescence on outer face; fore coxae with muddy pale orange stripe for full length on outer face; mid and hind coxae usually tending pale orange. Fore femora with similar stripe, the pale orange also covering much of outer face abutting femoral spines. Pretarsal claws black on distal half or more.

Opercula dark reddish brown but usually covered by pure white pubescence, rim narrowly edged black.

Abdomen. Tergites dark reddish brown; tergite 2 with a large central patch of fine white pubescent 'dusting', epipleurites 3-7 usually with similar white pubescence to varying extent; tergite 8 usually completely covered by white pubescence. Sternites dark reddish brown; sternites I and II sparsely covered by white pubescence, usually most distinct on distal margin of II; anterior margin of sternite III and lateral extremities of sternites III-VII usually with a little white pubescence.

Timbals (Fig. 10). Timbal covers dark reddish brown, usually with dense, pure white pubescence below adjacent to rim. Timbals similar to those of other *Thopha* species; three long ribs, the first near the margin of the timbal plate, broad and irregular in shape, the second narrow, nearly parallel-sided and joined ventrally with first; the third narrow and nearly parallel-sided; one short, very broad rib between first and second long ribs.

Genitalia (Figs 8, 9). Distal shoulders of pygofer weakly developed with distal portion bluntly pointed and turned backwards. Pygofer basal lobes not well developed, broad and rounded in lateral view. Uncus deeply divided into a pair of long, gently-tapering, tooth-like lobes, in dorsal view diverging, in lateral view angled downwards at about 45°; ventral tooth (clasper) completely fused with uncal lobe except towards apex, in lateral view short, bluntly pointed, its apex set back a little from apex of uncus.

Female. Similar to male. Tergite 8 with mid dorsal region bearing dense silver pubescence, remainder covered by pure white waxy 'dusting'. Abdominal segment 9 black, tending dark reddish brown below, irregular orange patch laterally on distal half.

Measurements. Range and mean (in mm) for 10 males and 5 females; includes smallest and largest of available specimens. Length of body: male 46.3 - 51.3 (49.1); female 47.7 - 51.4 (49.5). Length of fore wing: male 56.3 - 64.0 (61.7); female 58.9 - 64.2 (61.2). Width of head (including eyes): male 20.4 - 23.0 (22.1); female 21.5 - 23.0 (22.3). Width of pronotum (across lateral angles): male 18.4 - 20.7 (19.8); female 19.1 - 20.8 (19.8).

Etymology. Named in honour of Paul Hutchinson, who collected the first specimens of this new species.

Distinguishing characters. Distinguished from all other *Thopha* species by the lack of bold, jet-black markings on the head and thorax in addition to having the sigilla of the mesonotum ill defined. Also differs from *T. sessiliba*, the species that is probably the most closely allied to *T. hutchinsoni*, in the lack of dark reddish brown pigmentation on the sigilla; those of *T. sessiliba* are always dark reddish brown and similar in colour to the dark fascia across the head between the eyes. These differences in colour are consistent between the two species across their ranges including where their known distributions are almost sympatric (Fig. 11), at which point there is no apparent change in landform or vegetation. Further collecting is likely to show that the two species are in fact sympatric.

It is interesting to note that, while *T. hutchinsoni* clearly differs from *T. sessiliba* in colour and markings (and to a lesser extent in size), I could find no differences in male genitalia. The apparent variation in uncal shape, position of the ventral tooth, shape of the distal shoulder, basal lobes and aedeagus (Figs 4-9) all fall within the range of individual variation within the two species. There is no doubt, however, that *T. hutchinsoni* and *T. sessiliba* are distinct species because the differences in colour and markings are considerable and consistent. The colour forms of *sessiliba* discussed below are essentially differences in background tone, not in the basic markings. For example, no matter how pale or dark individuals of *sessiliba* might be the sigilla and fascia joining the eyes are always distinctly and similarly coloured. This is not so in *hutchinsoni* where the fascia joining the eyes is always present but the sigilla are never similarly highlighted.

Distribution and habitat (Fig. 11). Confined to Western Australia, where it is known only from near Exmouth and the eastern fringe of the Pilbara region. From near Exmouth there are records from 55 km south of Exmouth on the east coast of the Exmouth Peninsula and from 5 km north and 5 km south of Exmouth. On the Exmouth Peninsula, Paul Hutchinson also has noted specimens from Mandu Mandu in Cape Range National Park, Mowbowra Creek 6 km south of Exmouth, Badjirrajirra Creek 22 km south of Exmouth and the Charles Knife Canyon, Cape Range. From east of the Pilbara specimens have been collected at several locations along the Great Northern Highway between 135 km south of Port Hedland and 120 km south of

Newman. Both regions are semi arid, receiving approximately 200-300 mm average annual rainfall that comes mainly as summer thunderstorms and cyclones.

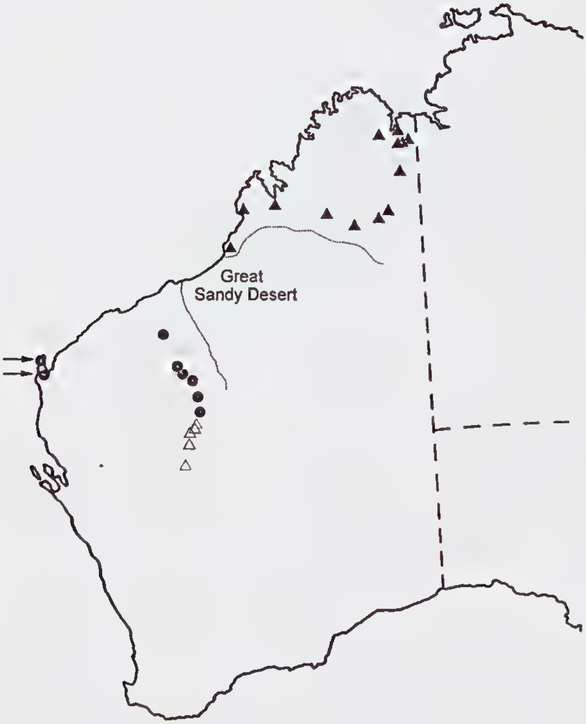


Fig. 11. Distribution of *Thopha hutchinsoni* sp. n. and *T. sessiliba* in Western Australia. Black dots indicate records of *T. hutchinsoni*, open triangles new records for *T. sessiliba* and closed triangles records from the previously known distribution of *T. sessiliba*.

Around Exmouth, adults usually frequent bloodwood, *Corymbia hamersleyana*, while east of the Pilbara they inhabit river red gums, *Eucalyptus camaldulensis*. Adults prefer the main trunk and limbs, sometimes perching high up near foliage. On the Exmouth peninsula they are restricted to stunted trees growing along ephemeral streams in limestone gullies emanating from the Cape Range. Along the Great Northern Highway the trees are taller and for the most part grow along sandy or stony stream banks that are tributaries of the Yule, Fortescue and Ashburton Rivers.

Adults frequently form communal aggregations, often with several occupying a single tree or group of adjacent trees. The larger a tree, usually the greater the aggregation within it. At times they can be approached relatively easily without alarm and sometimes can be taken by hand.

Adults emerge after heavy summer and early autumn rains and have been taken in mid February and early March. Because of this dependence upon heavy rain for emergence, combined with the unreliable nature of the rainfall, the appearance of adults is probably erratic.

Singing occurs during the heat of the day and at dusk. The song is a loud, drone-like whine, very similar to that of *Thopha saccata* as described by Moulds (1990). No recordings of the song are available for detailed analysis.

Relationships. Previously I discussed relationships among the then four known species of *Thopha* (Moulds 2001). *Thopha hutchinsoni* appears most closely related to *T. sessiliba.* The male genitalia of the two species are similar and what remains of the colour pattern of the head and thorax on *hutchinsoni*, that is the dark reddish brown fascia between the eyes and remnants of thoracic markings, is reminiscent of that of *sessiliba*, rather than the jet black markings of *T. saccata*, *T. emmotti* and *T. colorata.*

Thopha sessiliba Distant

(Figs 2, 3, 4-7, 11)

New records. WESTERN AUSTRALIA: 1 ♂, 192 km N of Meekatharra, 7.iii.2006, P. Hutchinson; 1 ♂, 146 km N of Meekatharra, 7.iii.2006, P. Hutchinson; 1 ♂, 57 km N of Meekatharra, 6.iii.2006, P. Hutchinson (PH); 1 ♂, ~167 km S of Newman, 24°42.759′S, 119°36.513′E, 607 m, 13.ii.2006, Hill, Marshall, Moulds; 1 ♂, 210 km S of Newman, 25°01.126'S, 119°24.560'E, 559 m, 13.ii.2006, Hill, Marshall, Moulds; 1 ♀, ~221 km S of Newman, 25°06.355'S, 119°22.369'E, 545 m, 14.ii.2006, Hill, Marshall, Moulds; 1 ♂, 1 ♀, 146 km NNE of Meekatharra, 25°35.579'S, 119°14.173'E, 545 m, 14.ii.2006, Hill, Marshall, Moulds; 1 ♂, 1 ♀, 55 km NNE of Meekatharra, 26°08.225'S, 118°41.721'E, 478 m, 14.ii.2006, Hill, Marshall, Moulds (MSM); 1 ♂, ~221 km S of Newman, 25°06.355'S, 119°22.369'E, 545 m, 14.ii.2006, Hill, Marshall, Moulds (WAM). NEW SOUTH WALES: 1 ♂, 64 km N of Lightning Ridge turnoff, 29°13.680'S, 147°52.475'E, 161 m, 24.i.2005, Hill, Marshall, Moulds (MSM).

The new records listed above show that *T. sessiliba* is widespread in Western Australia west of the Great Sandy Desert. Previously, there was just a single record from this region (Burns 1962, Moulds 1990), from Mundiwindi, but I have been unable to trace this specimen. Because Mundiwindi is close to the known distributions of both *T. sessiliba* and *T. hutchinsoni*, the identity of the specimen(s) is now in doubt so the record is disregarded here. The record from near Lightning Ridge in New South Wales extends the distribution of *T. sessiliba* a little further west in that State.

Distribution and colour of *Thopha sessiliba*

T. sessiliba is now known to be distributed across much of northern Australia from the headwaters of the Gascoyne and Murchison Rivers in Western Australia and from Nita Station (south west of Broome) to the Kimberley region of Western Australia (Fig. 11), across much of the Northern Territory to northern and eastern third of Queensland and in New South Wales along the inland margin of the Western Slopes south to Narrabri (Moulds 1990, 2001, and records from this paper).

A little south west of Nita Station the Great Sandy Desert ceases to support eucalypts and *T. sessiliba* almost certainly does not occur there. Thus, there is a distinct and significant gap in the distribution of *T. sessiliba* across this desert barrier. Specimens from east of this desert are typical *sessiliba* in colour and pattern (see Moulds 1990: pl. 7) while those from west of the Great Sandy Desert are distinctly different (Fig. 3). Western individuals have the head, pronotum and mesonotum similar in colour to the pronotal collar whereas typical *sessiliba* have the pronotal collar distinctly paler. The midline of the pronotum is always boldly marked by a broad dark reddish brown fascia that is rarely present in typical *T. sessiliba.* Further, the dark reddish brown fascia across the head between the eyes terminates just before the eyes, whereas this fascia nearly always meets the eyes in typical *T. sessiliba.*

It is possible that these western *sessiliba* are a different species but I am reluctant to describe them as such without more convincing differentiation. I could find no clear differences in male genitalia and there are no other structural differences apart from a tendency to be slightly larger. A study of DNA or song structure may show sufficient differences to justify species status but this information is lacking at present.

Thopha sessiliba from east of the Great Sandy Desert, the so-called typical *T. sessiliba*, show variation in colour tone across their distribution. I have previously documented how individuals darken as one goes north from about Coen on Cape York Peninsula (Moulds 1990: 57, pl. 7, fig. 2b) and how individuals west of about the Great Dividing Range in Queensland and through the Northern Territory and Western Australia are paler than specimens from eastern Queensland (Moulds 1990: 57, pl. 7, figs 2, 2a). Since that time a population of melanic individuals (Fig. 2) has been discovered by A.J. Emmott at Haliday Bay, north of Mackay (20°54'S, 148°59'E). Three males were collected on 2 January 2001, all similarly melanic. They are clearly darker than the darkest individuals from Cape York Peninsula. A single, even darker, specimen has been taken by Mark Lane near Chillagoe (17°03'S, 145°21'E) but this was a single melanic individual amongst an otherwise normal population. It is important to note that none of these melanic specimens have any markings jet black, but rather there is an overall darkening of all the normal body markings and pigmentation.

Key to *Thopha* species

The key to species of *Thopha* in Moulds (2001: 196) can be modified to include *T. hutchinsoni* and the western form of *T. sessiliba* by the following modification of couplet 1.

1 Head and thorax with bold, jet-black markings 2

– Head and thorax lacking bold, jet-black markings 1a

1a Mesonotum with thoracic sigilla ill-defined .... *hutchinsoni* sp.n.

– Mesonotum with thoracic sigilla boldly marked reddish brown 1b

1b Pronotum with midline always boldly marked reddish brown *and* colour of pronotal collar similar to remainder of pronotum .... 'western' *sessiliba*

– Pronotum rarely with midline boldly marked reddish brown, *if so* then colour of pronotal collar obviously paler than remainder of pronotum .... 'typical' *sessiliba*

Australia's largest cicada

The largest Australian cicada species has been regarded as *Thopha saccata*, with the largest specimen having a forewing length of 66 mm and a wingspan of 144 mm (Moulds 1990). I now have a larger specimen with a forewing length of 67 mm and a wingspan of 151 mm. The discovery of two further large species of *Thopha*, *T. emmotti* (Moulds 2001) and now *T. hutchinsoni*, necessitates a review of what is Australia's largest cicada.

At the time of description of *T. emmotti* there were only 20 known specimens and the largest attained a forewing length of 61.8 mm, less than the largest known specimen of *T. saccata*. Since that time additional specimens have been collected but the largest of these was only marginally larger.

Specimens of *T. hutchinsoni* tend to be larger than those of *T. emmotti* but, with a maximum forewing length of 64.2 mm and a maximum wingspan of 145 mm, they fail to eclipse the largest *T. saccata*. However, the known number of specimens is not great and it is likely that larger specimens will be found in the future.

Thus, for the time being at least, *T. saccata* remains the largest Australian species, measured by forewing length and wingspan. *T. saccata* is also the heaviest cicada; the dry weight of the largest specimen of *T. saccata* (a female) is 2.14 gm while that of *T. hutchinsoni* (also a female) is 1.81 gm.

Widest head

The genus *Thopha* belongs to a lineage of cicadas that includes a number of genera with very wide heads (Moulds 2005: 412). These exceptionally wide heads are a result of elongation of the vertex and does not directly relate to the overall size of the species. For example, the world's largest cicada, *Pomponia imperatoria* (Westwood), has a relatively narrow head. On the other hand, *Thopha* species are not only large cicadas but also possess wide heads. The head width of the largest *T. saccata* specimen is 21.5 mm but that of the largest *T. hutchinsoni* measures 22.5 mm, surpassing that of *T. saccata* by 1 mm. Remarkably, this is not only the widest head of any Australian cicada species, but the widest of any cicada in the world. Interestingly, it also has the widest head of any Australian insect.

Acknowledgements

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